University of Alberta

A Generation and Classification of the Possible Learning Styles Used in the Acquisition of Basic Swimming Skills

by

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Abstract

Regardless of the level of one's academic ability everyone has the potential to learn. It is important to identify the range of possible styles that may exist within the context of physical activity, in order to shift the focus from the teaching process to the learning process, making the acquisition of physical skills more effective for a greater number of students. The objective of this study was to generate a compilation of the possible learning styles used in the acquisition of physical skills. Participants of the study were students enrolled in a required physical activity course at the University of Alberta. Using content analysis, information generated by the participants through interviews and observation, was used to identify four major learning styles: Visual, Auditory, Cognitive, and Kinaesthetic. Each of these categories was comprised of several subcategories reflecting a variety of uses of the dominant category theme.

This is dedicated to Lori
I am the lucky one

A Generation and Classification of the Possible Learning Styles Used in the Acquisition of Basic Swimming Skills

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CHAPTER 1:

INTRODUCTION

Regardless of the level of one's academic ability everyone has the potential to learn. The difference lies in how individuals learn most effectively (Dunn, Giannitti, Murray, Rossi, Geisert & Quinn, 1990). Recommendations have been made about giving serious consideration to the relationship between teaching and learning style preferences, as well as to the possible effects that the matching of teaching and learning styles may have on intellectual development (Brunner & Hill, 1992; Draper, 1989; Draper & Young, 1989; Harrelson, Leaver-Dunn, & Wright, 1989;). When this type of matching is addressed, the focus of the learning environment will shift from a standard mode of instruction that most teachers adopt to one which facilitates and accommodates the use of the individual learning preferences of each student (Bloom, Crumpton, & Anderson, 1999). Buck, Harrison, and Bryce (1990) support this claim and add that enhanced performance can result from creating a learning environment that aims to increase the probability for experiencing correct trials by fostering the use of varied learning styles.

The term "Learning Styles" refers to the different strategies or ways in which an individual acquires an understanding of a new concept (Dunn & Dunn, 1978; Kolb, 1976). In the past, literature concerning learning styles has focused on measures designed for use in specific contexts, such as the school classroom (Dunn, Dunn, & Price, 1989) and in the realm of business management (Kolb, 1985). This early research has been most beneficial in creating profiles that address issues such as course content or in gauging individuals' levels of development. Educators and corporations have used these instruments to enable them to determine which learning styles their students or

employees use in order to learn new information efficiently. Research has also been completed that has used specific learning styles as a means of testing the effectiveness of certain models (e. g., learning models), (McCullagh & Meyer, 1997). Recent research has led to a discussion about the relationship between teaching and learning (Hamman, Berthlot, Saia, & Crowley, 2000), as well as to recognizing that learning styles shift as a function of the context in which they are used (Coker, 2000).

Rationale

The range of possible learning styles that may exist within the context of physical activity has not yet been fully explored. The current profiles that are being used in the area of physical skill acquisition have either been adapted from existing profiles (Brunner & Hill, 1992), or that may be insufficient to cover the entire spectrum of learning styles that are specific to the acquisition of physical skills (Ogilvie, Greene, & Baille, 1997). For this reason, the question asked in this study is: What are some of the possible learning styles that would be employed in the acquisition of physical skills? Through the use of multiple case studies, this study proposes to initiate a compilation of learning styles used in the acquisition of physical skills. The major objective of this study is to create an initial taxonomy of such styles that could ultimately be used to produce a viable Learning Styles Profile diagnostic tool. Physical education teachers might administer such a tool in order to develop and deliver learning opportunities that are specifically tailored to the varied individual learning styles of their students. To this end, creating a taxonomy of learning styles that is generated within the context of physical skill acquisition could be used to create a Learning Styles Profile for use in physical activity environments. This tool could provide a more accurate assessment of individual learning

styles and allow instructors in a physical activity setting to make learning more efficient and more effective for a broader range of learning types. The primary goal of this study, then, is to provide an initial identification of the prominent learning styles that likely exist within a physical activity setting.

Limitations

There are several limitations to this study: The participants who were invited to take part in the study were chosen because it was assumed that university level students would be old enough to be able to articulate and expand on their thoughts. This was very important as the structure of the study was founded on open-ended interviews. The Physical Activity Course (PAC) from which the participants were recruited was offered during the spring session and is a mandatory course for the undergraduate students in the Faculty of Physical Education and Recreation. The mandatory nature of this class provided an increased opportunity to recruit participants who reflected a range of skill levels and would likely find that they would encounter novel skills during the course. This PAC course was also readily available, as the other mandatory PAC courses were not offered at the time of the study.

Another limitation was that there was minimal representation of male participants, thus gender effects for learning style preference cannot be inferred from the results of this study. As well, there was no representation by students with physical or mental disabilities, so it cannot be inferred as to whether or not these styles can be applied with those populations. There is great difficulty in replicating a qualitative case study (Yin, 1994).

A further limitation of this study is that it was completed with only one type of activity, swimming skills. Thus the context of learning reflected in this study may not be very representative of contexts where other physical activities are being learned (e. g. team sports, dance etc.).

CHAPTER 2:

LITERATURE REVIEW

Two popular instruments created to evaluate learning styles are Kolb's Learning Styles Inventory (1976) and Dunn and Dunn's Learning Style Inventory (LSI) (Dunn, Dunn, & Price, 1975, 1989). Kolb's Learning Styles Inventory (1976), which categorises individuals into one of two bipolar dimensions, was created in 1976 for the purpose of addressing management training needs (Cornwell & Manfredo, 1994). The LSI (Kolb, 1976), was based on Kolb's Experiential Learning Model (ELM) created in 1974 (see Figure 1). The ELM was a two dimensional model aimed at classifying learning styles according to the different stages in the learning process and were based on a rank order of the four dimensions. The stages represent a continual process where each can be understood as follows: Concrete Experience (CE) is the learner's participation in a novel experience, this leads to a Reflective Observation (RO) or the learner's reflection on the experience. The Abstract Conceptualization (AC) is the learner's attempt at developing informal theories about the experience, which then leads them to the final dimension, Active Experimentation (AE) where the learner uses their informal theories to help them decide how to best deal with the experience in the future (Hwang & Henson 2002).

Different combinations of the stages resulted in the identification of four distinctive learning styles dependant on where the learner falls on the two dimensional continuum. For example, learners may either favour concreteness over abstractness or vice versa, or they may favour concrete conceptualization over active experimentation (Hwang & Henson 2002). The four learning styles that then emerge are: the assimilator

which is a combination AC and RO; the converger which merges AC and AE; the accommodator, who prefers CE and AE; and the diverger which combines CE and RO.

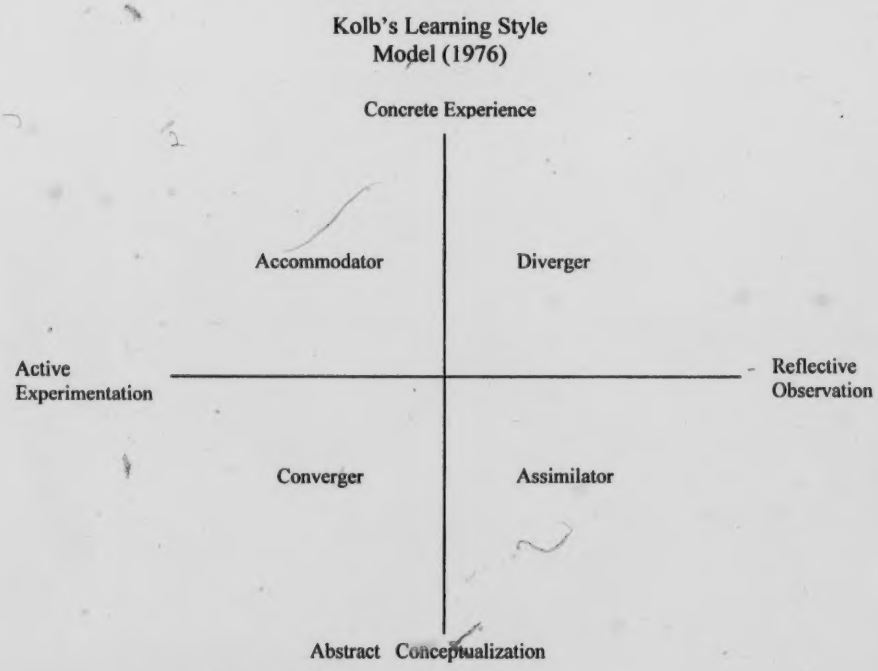

Figure 2.1 Kolb's Learning Styles Model (Kolb, 1976)

Kolb (1976) indicated that these learning styles were based on the experience, environment and heredity of the participant. The major flaws found with the original LSI (Kolb, 1976) after an evaluation was its poor score reliability and construct validity (Hwang & Henson, 2002; Ruble & Stout, 1994). This led Kolb to revise the measure to address these concerns, and the revised LSI was produced in 1985. The revised LSI (Kolb, 1985) was based on the same four-dimensional scale. The format of the revised LSI (Kolb, 1985) employed a sentence completion format where the participants were provided with possible endings based on the four dimensions in order to complete sentences such as "I learn best when…" (Ruble & Stout, 1994). The sentences are then rank ordered from 1-4 identifying the statements that are respectively the least and most

like the participants. The revisions to the original LSI were unable to sufficiently address the measures original problems with validity and reliability and now posed a third problem with response set bias inherent in the sentence completion format (Geiger, Boyal, & Pinto, 1992; Ruble & Stout, 1994; Sims, Veres, Watson, & Buckner, 1986). As well, reviews of the LSI (Kolb, 1985) deemed it to be without foundation in current relevant cognitive theories such as those related to active learning and memory, making it solely a self report inventory (Biggs, 1985; Miller, 1985).

In order for this inventory to be used in a physical activity setting, these dimensions would have to be founded in current research pertaining to learning and physical activity, and then the measurement items would need to be adapted for a physical activity setting. And, even if the questions were adapted, they would still be limited to the doing-watching and feeling-thinking dichotomies and may therefore be insufficient for evaluating the full range of possible learning styles that could be in use. In effect, these four combinations disregard other dimensions that may have an effect on physical activity learning style.

A second tool that was created to evaluate learning styles is the Learning Style Inventory (LSI) (Dunn, Dunn, & Price, 1975, 1989). This inventory was based on the Dunn and Dunn Model of Learning Style Preferences that was developed over the period between 1967 and 1993 (Dunn & Dunn, 1999). The objective of this model is to identify the methods, resources, and instructional environment most preferred by individual students by assessing their processing characteristics with regards to environmental, emotional, sociological, physiological, and psychological stimuli (see Figure 2) (Dunn, Griggs, Olson, Beasley, & Gorman, 2001).

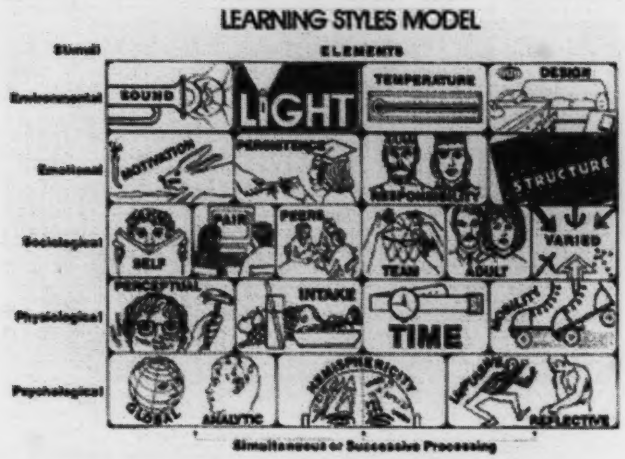

Figure 2.2 Dunn and Dunn Learning Styles Model (Dunn and Dunn, 1993)

The LSI (Dunn, Dunn, & Price, 1989) is comprised of 104 items grouped into 22 scales to represent each of the elements in the Learning Styles Model. The Likert-type scale measure is designed to identify the conditions under which students prefer to learn (Drummond, 1987). The reviews of this instrument indicate that its shortcomings are mainly due to the lack of information provided in the manual by the creators of the measure. For example, the number of items that reflects each scale is not disclosed, nor is there any information about the internal consistency for the scales. As well, the scales may not possess adequate reliability due to the fact that some of the scale scores may be based on too few items (Drummond, 1987; Huges, 1992; Westman, 1992). It has also been stated that the authors may have neglected literature that indicates that there is no relationship established between some of the elements that comprise the Learning Styles Model (e.g. temperature) and the benefits to learning (Huges, 1992).

A third example of a learning styles measure is the lesser known Learning Styles Profile (Ogilvie, Greene, & Baillie, 1997). This tool is a bipolar measure that is limited to

detecting learning styles in four dimensions (TriModal Learning, Learning Preferences, Teachability, and Optimal Learning). The profile contains categories that are nondescript. For example, the TriModal Learning Category contains a subcategory called Trial and Experience, which is defined as "experiencing different ways of doing a skill" (p. 6.2). While this measure may seem to be tailored for a physical activity setting, there are two important factors that need to be noted about this profile. The first is that the categories that pertain to learning style were generated by the authors of the manual and not the participants of the study; and secondly, the majority of the categories are seemingly reflective of personality traits rather than learning styles. As this is not a well known profile, there is little to no evidence to support its use other than that provided by the authors.

Initially, the suggestion was made by Buck, et. al. (1990) that the goal of a good learning environment is to maximize the number of correct trials experienced by a student. One of the ways to accomplish this is by using the students' preferred learning styles to help them acquire the skills necessary to complete their physical activity courses. The possible learning styles discovered in this study were grouped in to four major categories: visual, auditory, cognitive and kinaesthetic. The major categories and their respective sub and lower order categories will be discussed with regards to the current literature.

CHAPTER 3:

THEORETICAL PERSPECTIVE / METHODOLOGY

Theoretical Perspective

Constructionism is the view that "meaning is not discovered, but rather is constructed" (Crotty, 1998, p. 9). One of the key aspects underlying this study is the idea that people use their experiences and surroundings to actively construct new knowledge. In this study, the participants will be invited to actively construct knowledge about their learning styles from their own experiences. It is these experiential differences, from which individuals construct their reality, which may contribute to a wider variety of learning styles, thus allowing a taxonomy to be formed. Given the notion that "truth is the result of perspective" (Denzin & Lincoln, 1998, p. 236), any reference made to progress in the study will be based on participants' perceptions of their own development within the physical activity setting.

Stemming from constructionism is the underlying principle of symbolic interactionism. Symbolic interactionism forms the basis for understanding the data that will be collected for this study. Since the aim of this study was to identify the various learning styles that the participants report using in the acquisition of physical skills, the data generated will reflect the meanings that the individual participants have placed on various aspects of learning. As Blumer (1969) suggests, it is the use of meaning, language and thought that are the central tenets of symbolic interactionism. Meanings are constructed, refined, and interpreted in part via the usage of language and thought and are central to symbolic interactionism since it suggests that human behaviour is governed by the various meanings that individuals assign to other people or things.

Methodology

The design used in this study was that of a Collective Case Study (Stake, 2000). A collective case study approach allows researchers to study several cases for the purpose of gaining insight into an issue and possibly drawing generalizations. The cases are chosen because researchers believe that understanding them will help them to better theorise about a larger collection of cases (Stake, 2000). For this reason, multiple participants were chosen for this collective case study. A case study approach also provided the opportunity to gather as much information as possible pertaining to the interests of the study primarily through the use of in depth interviews. Among the merits of the case study approach is the fact that it is open-ended, allowing the researcher to gather as much information as is necessary on the topic of focus. A case study approach was well suited to this type of exploratory investigation as it allowed the phenomenon of interest to be studied in a real life context. However, doing so also tends to be problematic, especially because the distinction between a phenomenon and its context is not clearly evident (Yin, 1994). There were no hypotheses to be tested in this exploratory study and being able to have the participants generate possible learning styles meant that the interviewer had to conduct the interviews without any preconceived notion of the learning styles that may have already been identified in the literature. Although it was necessary for the researcher of this study to be aware of the literature pertaining to the research on learning styles, interview questions were designed to be open-ended so that there would be no researcher influence on the responses given by the participants. The use of a case study format allowed a wide variety of pertinent data to be generated from a

relatively small number of participants, data that could be further examined to obtain a generalized theoretical proposition.

While some researchers argue that the data generated using the case study approach may not be replicable, it should be remembered that the purpose of this study was to explore the existence of multiple learning styles for physical skill acquisition rather than to test a particular model for learning. As Yin (1994) suggests, "case studies, like experiments, are generalizable to theoretical propositions and not to populations or universes" (p.10).

There are several important components to be considered in creating a research design for case study based research. These components are the researcher's questions and propositions, the unit of analysis, and the linkage of data to postulations based upon the criteria for interpreting the findings (Yin, 1994). Briefly stated, this research begs the question: What are the possible learning styles that are employed in the acquisition of physical skills? The study required that two interviews be conducted, one prior to the observation sessions, and one following. Each interview generated a substantial amount of text, which became the unit of analysis for this study. The last aspect considered regarding the design is the criteria for interpreting the findings. In this study, triangulation (Patton, 1990) was also used, a concept that will be elaborated upon later.

Participants / Procedure

Participants were solicited from a mandatory introductory Physical Activity Course (PAC) at the University of Alberta and included only those students who were 18 years of age or older. The course (PAC 110: Aquatics) required that each student be able to perform swimming skills ranging from basic to intermediate at a satisfactory level as

determined by course criteria and assessed by the instructor. The rationale behind the use of this sample group was that there was thought to be a greater likelihood that a broad variety of skills, abilities, and learning styles would be present in a required activity course. This means that the chances of recruiting students who are unfamiliar with the required skill sets would have been better than in optional PAC courses.

The instructor of the PAC 110 course was contacted by phone two weeks before the start of the class in order to get permission to approach the students about participating in the present study. It was stated clearly in the conversation that the purpose was to recruit the students for the study. After permission was granted, it was decided that it would be best if the students were approached and provided with a brief information session about the study on the first day of class. After the verbal information session concluded, each of the nine students were provided with written information letters (Appendix II) as well as consent forms that would be used to indicate whether they wished to participate in the study (Appendix IV). After the consent forms were returned, students were informed about how the course would be structured in terms of course content and the sequence in which the skills would be introduced. This was helpful as it allowed the coordination of videotaping with the skills that each participating student identified as being novel. This was done via the use of a questionnaire (Appendix I) after the first interview. After the first day of class, the consent forms were sorted according to which students did and did not want to participate in the study. It was found that one of the nine students chose not to participate at all, but provided permission to videotape during the course. One by one, the students who indicated that they would be interested in participating in the study were chosen randomly and contacted in order to set up a time

for the first interview. After each interview a new participant would be randomly chosen and contacted to arrange an interview time. The final number of participants was determined using theoretical sampling in which interviews continued until the point of saturation when no new information was being generated (Strauss & Corbin, 1990).

Bauer and Gaskell (2000) suggest that using a large number of participants does not necessarily result in the compilation of a greater amount of usable information. The expectation for this study was that due to the depth of the interviews, and the amount of information that could potentially be produced, the number of participants used would not exceed ten. In fact it did not. Saturation was reached at N=5, and produced a population consisting of four females and one male, all between the ages of 20 and 25. There was a wide range of ability represented by the five participants. One participant who simply possessed the minimum requirements to enrol in the course characterized the least amount of ability. On the opposite end of the spectrum, another participant was a national competitor in a 'water sport'. Three of the five participants also had experience coaching different sports and, for the most part used their experience as an added resource to help them respond to questions during the interviews. Most importantly, all of the students who chose to participate in the study, regardless of their skill level, stated that they felt they would be presented with at least one novel skill with which they were unfamiliar, and anticipated a need for learning within the duration of the course. This was an important factor in the study as it was important that each participant would need to actually "learn" some new skills.

The course was held each weekday for three weeks. The investigator was in attendance of every non-examination class, videotaping each of the participants who had

participated in the initial interview. The videotaping was dynamic in that a tripod was used, which allowed for easy mobility of the video camera. Thus, the instruction of skills was videotaped from angles and positions, which were of the investigator's choosing.

Data Collection

The primary methods of data collection for this study were the interviews conducted with the participants, as well as observations collected in the form of field notes.

Interviews

Pilot Interviews

There are certain skill sets required by an interviewer in order to tease out relevant information in a professional and ethical manner. An interview guide was drawn up using information gained from two pilot interviews. Although the interviewees from the pilot interviews were further along in their academic studies than the participants of this study, it was found that their experiences with novel skills were representative of the eventual participants. The first pilot interview was conducted with a 30-year-old female who was in the process of doing her Ph. D., and who used her novel experience with tennis as the basis for her responses. The second interview was with a 23-year-old female who was in the process of doing her MA degree. The second pilot interviewee was able to use her novel experience with ballet to respond to the interview questions. Both of these participants were colleagues who had experience with interviewing, and were capable of providing useful feedback regarding the interview process in its entirety.

The pilot interviews were effective in obtaining information about the relevance of the questions posed, as well as providing feedback on interviewing techniques,

inclusive of the skills used as well as the development of rapport throughout the interview. Kvale (1996) suggests that advanced preparation is the key to the interactions during the interview as well as the overall outcome. Taping and reviewing the pilot interviews allows the interviewer to become comfortable with the background information related to the topic and provides practice with conducting informal conversations on a particular theme using an interview guide. Additionally, the interviewer can practice structuring the interview to ensure consistency of the information throughout and can pose critical questions to test the reliability of the responses, both of which will help with future interpretation and analysis of the responses. Finally, the pilot interviews facilitate the refining of interview skills such as active listening, allowing the participant to finish his/her thoughts, and creating an overall friendly atmosphere (Maykut & Morehouse, 1994).

Formal Interviews

To ensure the maintenance of ethical standards, before the interviews were conducted, participants were provided with information letters clarifying the purpose of the study and what would be required of them (Appendix II). Written consent was required from all participants (Appendix IV) in order to use or publish the information obtained from both the interviews and in class observations. The participants were assured that everything involving their participation in the study, including the statements from the interviews, transcriptions, coding, data from field notes, and video, would be kept confidential and stored in a locked filing cabinet, accessible to only the researcher and supervisor. The participants were also notified by the researcher that it was their right to see the transcripts and interpretations, as well as to be informed of the consequences or

hazards (if any) of the study. As well, with the permission of the interviewees, all interviews were recorded with an audiotape recorder. It has been suggested that the use of a tape recorder allows the researcher to focus more on the topic and the questions than having to take notes on the responses (Kvale, 1996, Maykut & Morehouse, 1994). This point was valid as it was very beneficial to have the audiotapes when reviewing the data from the interviews.

All participants were interviewed twice. Each initial interview was between 30 and 40 minutes in length and the follow up interviews lasted between 15 and 20 minutes. The first set of interviews and follow up sessions were conducted in a separate, private room during the first three days of the course. The purpose of the first interview was to get information about the participant's prior experiences with acquiring novel physical skills as well as to question the participants about what they expected to learn from the class. To conclude the first interview, the participants were asked to complete a questionnaire (Appendix I) that indicated which of the various skills being presented in the course they felt would provide them with a novel learning situation. They also received an informed consent form (Appendix III). The second interview sets were conducted in a private room in the Physical Education building on the University of Alberta campus. The purpose of the second interview was to probe the participants with questions that helped them explain how it was they felt they were able to acquire the skills they had initially indicated as being novel. The participants were also presented with the video footage of themselves receiving instruction in those novel skills. This gave the participants the opportunity to reflect and describe what it was they remembered doing in order to acquire the given skill. All of the second interviews and follow-ups

were conducted within the two weeks following the final class of the course. Scheduling for all of the interviews and follow-ups was determined by the interviewees according to their own convenience.

Keeping a flexible structure, as well as stating a clear purpose for this study, was a key to the success of the interviews. All participants were told that the purpose of the study was to determine the most prominent learning styles used when acquiring a physical skill. The interviews took a semi-structured format providing the interviewer with the flexibility to vary the probes used in order to elicit explanations and examples that best illustrated the meaning behind each participant's responses. It was made clear that the study was exploratory in nature, and that there were no hypotheses to be tested. This was done to decrease the perception that certain 'answers' were being sought. An interviewer who explains the purpose of a study can make use of direct questions or can choose to use indirect questions, leaving an explanation of the study for the end of the interview (Kvale, 1996). The participants in this study were briefed in advance of each interview, providing them with an explanation for the purpose and scope of the study, as well as the methods (i. e., use of a tape recorder during the interview) that would be employed. Following each interview, I reviewed some of the key points from the interview and allowed the participants to ask any further questions he/she may have had regarding the interview. By doing so, the participants were provided with the opportunity to make any last comments, clarifications or corrections regarding the interview content.

The interview guides (Appendices V (a) and (b)) were semi-structured and flexible, with an outline of topics to be covered and some suggested question types. The questions actually posed reflected the interpersonal dynamics of each interview and

focused on soliciting descriptive responses from the interviewees through the use of phrases such as "what happened" and "how"? Determining the "why" aspect was suggested to be left to the investigator after the interview had taken place (Kvale, 1996). Interview guidelines as suggested by Kvale (1996) were adapted to meet the needs of this study. In order to achieve a quality interaction during the interview, the interviewer should be aware of the certain key criteria throughout the course of the process. An environment should be created that encourages active, spontaneous, specific, and relevant answers from the interviewee. This was accomplished by using short open-ended questions, as well as following-up and clarifying relevant aspects of the answers given. Throughout the interview, active listening, paraphrasing and summarizing techniques were employed in order to verify interpretations of the answers that arose during the interview. As well, probes were used to create some flexibility in terms of allowing the course of the interview to be governed by the interactions taking place, provided they remained relevant to the scope of the study (Kvale, 1996; Maykut & Morehouse, 1994). Rubin and Rubin (1995) suggest structuring in-depth interviews using three types of questions. The main questions act to guide the interview as it progresses; probe questions provide richness in terms of detail and clarification; and follow-up questions address any new issues that may arise during the interview. Follow up interviews were used in this study to provide the opportunity to elicit clarity and confirmation about the conclusions drawn based on the responses given during the initial interviews.

In addition, Côté (1999) recognizes that maintaining rapport during an interview is important so as not to convey an image of superficiality. It was important that the interviewer was able to express interest in participant responses and to create a positive

and comfortable environment in which the participants felt they could fully express themselves. Through both verbal and body language, the interviewer needed to be able to "remain neutral regarding the content of the interview" (Côté, 1999, p. 400) but convey a sense of support towards the participants' expression of their own perceptions.

Direct Observation

Observational data was collected through the use of a video recording and field notes of each participant in the context of a class session. The video recordings of the participants were used to aid recall during the second interview. This visual aid provided support for the information given by the participants during their initial interviews and was used to ensure accuracy of the information.

The basis of the field notes were direct observations made in the class environment that were pertinent to the study and aided in overall understanding. The variables addressed in the field notes were the observations of each participant that were descriptive in nature. This means that the researcher witnessed and recorded a particular event, where it was required to make inferences regarding the underlying themes behind a particular observation (Bernard, 1988) and kept a record of it. The field notes were used primarily to try to understand an ongoing behaviour, situation, or event, as well as to observe specific behaviours within their natural context. Bernard (1988) refers to this as the 'eyeballing method', and it can be used to help explain such things as in-class behaviours or interactions between learners. Through the use of inductive coding, themes and concepts that matched categories generated in the interviews were carefully noted through direct observations. This was especially useful when the learners were presenting their in-class projects related to water sports, which were mandatory for the course, as

opposed to having handed in a paper in lieu of the presentation. More specifically, observations related to the different techniques used to complete the assignment were logged and used to create questions for the final interview that were unique to each participant and related specifically to their projects. It was also helpful to make notes of behaviours that had been observed on the videotape in order to aid observer recall for potential questions while going through the videotapes with the participants.

There are limitations to field observation, such as the decreased reliability of observations because they cannot be replicated and the inability to generalize about an individual observation. There is also the possibility of researcher bias, as the researcher may find what he/she may want or expect to see (Maykut & Morehouse, 1994). However, an awareness of these problems will act to minimize their negative effect on the research data. It was felt that the researcher's constant presence in the class starting on the first day was beneficial in limiting the effect that presence may have potentially had on the students, regardless of whether or not they were participants in the study. This presence on deck while videotaping seemed to not be an issue and in fact, seemed welcome and unobtrusive in the class.

The limitations regarding the use of video recordings involve the resources available. There was only one video recorder in use and the data collected had to cover all of the participants in the class. It is possible that some valuable data may have been missed but it seemed to not be an issue during the final interview as the footage shown to the participants proved to be sufficient for the purpose it was intended. As well, the use of video recordings required that an unobtrusive set up be used so as to minimize researcher intrusion in the class setting. Therefore all the video taping was done from a suitable

distance. To minimize the effects of these potential problems, good observational notes were taken and the videotaping methods were kept unobtrusive. It was initially thought that the students would need a period of adjustment in order to get used to having their class taped, but in the end, did not seem to be an issue as there were no detectable instances when the learners balked at or avoided being videotaped. An additional effect of direct observation occurred during the interview process. In this study, rapport was undoubtedly enhanced by the attendance of the interviewer at all instructional sessions.

Data Processing

Transcription

The first step required to process the data from the interviews was to transcribe them. Recorded interviews were transcribed verbatim, as it was important that no information was lost when converting information from one language form (oral) to another (text) (Kvale, 1996). In doing so, specific details were addressed such as the source of the transcribed materials, issues relating to the reliability and validity of the transcribed information, and the pragmatics of transcription (i. e., who would do it, how long it would take, and the style to be used).

Issues concerning the reliability of the transcribed information were addressed in the following way. The quality of the audiotape recording as well as the experience of the typist was a major factor affecting the amount of time needed to complete the transcriptions of the interviews. The investigator was the only person to transcribe all the interviews, and did so according to the purposes and procedures of the transcription method that had been set out prior to the data collection. The tapes were then thoroughly reviewed against the transcriptions. Two other individuals reviewed random sections of

the audit tape to ensure the accuracy of the transcriptions. It took approximately 2 months to transcribe all of the interviews in their entirety.

The issue of validity is more difficult to address, as there is no completely objective means by which to convert oral information into text (Kvale, 1996). In light of the fact that the main focus of this study was to detect the many possible learning styles present in the acquisition of a physical skill, the validity of the transcription is in part a reflection of the validity of the interview structure. It was essential, however, to ensure that the transcribed written text captured all relevant statements pertinent to this study that were present in the oral comments.

Data Analysis

Coding

Coding of the data began once the transcriptions of all the interviews were complete. Coding serves as a helpful means of ordering and identifying sources of data; creating an ordered set of data that eliminates confusion (Maykut & Morehouse, 1994). The first step in effectively coding the data was to indicate the type of data (interview), the source of the data, and the page number of the original data set where the specific data point was found. This ordering system decreased the amount of time needed for effective data retrieval and organization and kept the subsequent steps free of confusion.

The second step in coding was to unitize the data into identifiable units of meaning. Maykut and Morehouse (1994) suggest that each unit be cut from a photocopy and fixed to an index card that indicates the particular unit of meaning. Doing so serves to highlight each individual unit and separate the units from each other. If such was the case that a whole unit of meaning consisted of multiple smaller units of meaning,

duplicate or triplicate copies were made for the ease of future categorization. For example, P3 stated in her first interview "I would learn best from seeing things...if somebody does it for me and I can watch it as they are explaining it...", this statement is representative of the visual category as well as the auditory category and as such was duplicated and categorized accordingly. When this was completed the data was then prepared for the next step of analysis. Further reduction of the data to key units of meaning is done through what Kvale (1996) calls 'Meaning Condensation', a process in which a key word or phrase is used to summarize the unit of meaning appearing on each index card. Lincoln and Guba (1985) suggest that each unit of meaning should be able to stand by itself without any explanation except for knowledge of the focus of the study.

Step three in the coding of transcripts was the discovery phase. This phase involved the preliminary search for important meanings or recurring trends in the interview text or observed notes. The discovery phase attempts to identify and categorize key elements of the data (Kvale, 1996) such as the concepts interviewees used to illustrate their comments or actions over the course of the study. Preliminary categorization of pertinent units of meaning began using information obtained in the initial discovery phase to answer questions regarding the focus of the inquiry.

These essential invariant themes were used as the foundation of the taxonomy. The data analyses were based on transcriptions and the coding of all of the texts gathered from the interviews. The constant comparative method (Glaser & Strauss, 1967) served as the format for the coding of the data whereby categories consisting of similar units of meaning could be determined. The data gathered was compared across participants to see whether any common themes arose. This inductive approach required that the data

collected relate directly to the focus of inquiry, and, as such, the categories generated from the data were not be based upon any pre-existing typologies but are reflective of contextual patterns in the actual data collected (Maykut & Morehouse, 1994).

Constant Comparative Method

As defined by Bauer and Gaskell (2000), the process of content analysis "is a technique for making inferences from a focal context to a social context in an objectified manner" (p.133). Content analysis in this study consisted of a literal analysis of the interview text, incorporating Glaser and Straus' (1967) constant comparative method. This method allows the researcher to not only inductively code collected data but also to refine the chosen categories as the analysis progresses, using a simultaneous comparison of all units of meaning obtained. Simply put, new units were compared to existing categories, and if these units were similar, they were categorized as such; otherwise, a new category was created.

The four basic steps in the constant comparative method were undertaken for the analysis of the data generated by this study (Glaser & Straus, 1967). The first step used was inductive category coding, which involved creating provisional categories by analyzing the initial discovery sheet for recurring concepts or themes, while combining any overlapping ideas into similar headings. The objective of categorization was to match unitized data cards to existing provisional categories in order to create new categories when the data cards warranted it.

The second step involved utilizing the rules of inclusion to further refine these provisional categories. Categories were coded according to the properties or characteristics clustered together under that category to help identify the data cards that

comprised it. The key was the use of propositional statements. Lincoln and Guba (1985) defined propositional statements as those statements that convey the meaning contained in the data cards gathered together under a category name. For example, the phrase 'I enjoy a demonstration' was used by P3, and within the context of the study needs no explanation.

After the categories were refined, the third step consisted of the exploration of relationships and patterns across these categories via the analysis of propositional statements began. This step involved studying which statements could stand alone and which could form salient relationships or patterns with others. Those statements that shared common meanings were grouped together, resulting in what are termed outcome properties (Maykut & Morehouse, 1994). These are identified as the Lower Order categories.

The final stage of this method involved taking the refined, independent categories and representing all the data in pertinent categories. It was essential that the process taken to construct the categories, and the understandings and inter-relationships generated between categories were disseminated with respect to the focus of the study. These are the sub-categories of the major themes discovered.

Quality of Research Design

An important part of the data analysis is the actual quality of the research design. The issue of validity in qualitative research is addressed through the constructs of confidence and relevance (Bauer & Gaskell, 2000). The confidence of a study is what ensures that the results of the study reflect the data collected and are not merely a representation of the researcher's interests. The relevance of a study is a combination of

the importance of the research, and the utilitarian purpose that the research serves. In order to judge the trustworthiness of this study, three factors were examined: an explanation of the contribution that triangulation made to the overall strength of the study; the benefits of an audit trail; and the use of research teams and member checks.

Triangulation, which is the convergence of a major theme or pattern in the data via the use of multiple methods of data collection (i. e., the interview–observation-interview process that was followed), lent strong credibility to the findings. The use of multiple methods of data collection allowed for understanding from several points of view, and the inherent strengths of one method serves as a mitigating factor for the inherent weaknesses of another (Patton, 1990). Regarding case studies, Yin (1994) points out that they draw on multiple sources of data, allowing this data to be correlated through triangulation. Case studies not only attempt to document the 'what' but also begin to explain the 'why' of a phenomenon. More specifically, the participants in this study were able to articulate how they thought they learned by responding to interview questions, as well as providing any reasons that they may have had for their interpretations.

In addition to triangulation, the use of adequate documentation permits others to understand the process undertaken throughout the study and served as verification for the techniques used. The method used, the assumptions made, and the data collected were all well documented, allowing other experts in the field to understand the reasoning behind the conclusions drawn in this study, without questioning the steps taken to arrive at the conclusions (Maykut & Morehouse, 1996). As the investigator worked with the data, it was important to have a colleague who was in the same field, and in this case a

committee member, periodically review the audit trail to provide constructive feedback and highlight potential points of bias.

Finally, a major source of constructive feedback employed to ensure that the data being recorded was as accurate as possible was the participants themselves. By conducting what is known as member checks (Lincoln & Guba, 1985), the researcher enables the interviewees to make sure that the data that has been recorded is a true representation of the information they conveyed during the interviews. As well, member checking is a means by which to validate researcher inference and interpretation of the data generated (Holt & Sparkes, 2001). In this manner, any inherent bias or accidental omission on the part of the interviewer is less likely to taint the collected data (Maykut & Morehouse, 1996). In order to achieve an accurate member check, a follow up interview was conducted after each interview with each participant, producing twenty sessions in all.

CHAPTER 4:

RESULTS and DISCISSION

The results of this study will be presented as specifically pertaining to the context in which they were produced. The results are presented in terms of the four main themes that arose from the data (see Figure 3). The criteria for placing the data into the various major categories involved the identification of key words by the participants that most closely related to each main category; for example, the use of synonyms and antonyms (Rubin & Rubin, 1995). These themes were then analyzed in order to reveal their sub-categories and were once again broken down into lower order categories. The results of this study were interpreted on the basis of whether or not multiple learning styles were in evidence, and it was found that the participants seemed to prefer four major learning styles. The results of the study are a reflection not only of the nature of the study, but also of the usage of a case study as the experimental design, and the structure and method employed during the interviews. Research to support each of the main themes that emerged in this study will be discussed along with the relevant literature pertaining to the sub categories and lower order categories that emerged; providing overall support for the possible learning styles identified in this study.

The purpose of conducting this study was to discover which learning styles were used in the acquisition of basic swimming skills, in the hopes that the information discovered could eventually be used to initiate the design of a learning styles profile to be used in physical activity settings. Four learning styles were identified as being most often preferred by the participants: the visual, verbal, cognitive, and kinaesthetic. These four styles were then broken down into subcategories and then lower order categories. The

benefit of identifying the lower order categories of each style is that doing so will help in understanding the more specific applications of the four main styles.

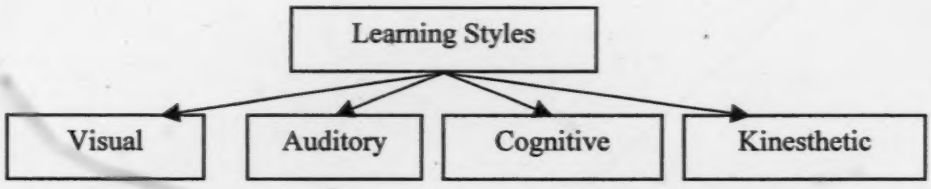

Figure 4.1 Four Major Learning Styles generated from the present study

Visual Learning

One of the prominent themes to emerge was that of the Visual Style. Given the nature of physical activity, the importance of this style would seem quite obvious, Over the course of the interviews, many sub-categories as well as lower-order categories emerged, and provided explanations for the different reasons behind the preference of, or benefits for, using this style.

Analysis of the visual theme indicated that it may be divided into four different subcategories. These subcategories were identified using the following headings: The use of the visual learning style by the instructor and other students in the class, personal use of the visual learning style, beneficial use of visual aids, and finally, the preference to not use the visual learning style. Compilations of direct quotes from each participant interview resulted in the emergence of ten different aspects that defined the nature of this theme (See Figure 4).

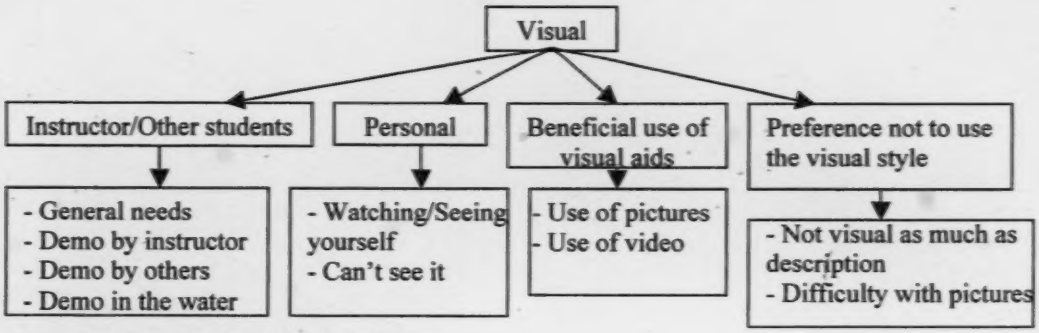

Figure 4.2 'Visual' Sub Categories

Instructor/Other Students

General need for visual information

This category was created as a result of statements from four of the five participants who indicated an overall, or general, need to be presented with visual information. This desire was indicated most directly by P5 and P3, who respectively stated, "Having a demonstration is essential. I think [that] a demonstration really works", and "I would learn best from seeing things…if somebody does it for me and I can watch it as they are explaining it…"

Research conducted by Catina (2000) indicated that the provision of a visual demonstration, or model, when used in teaching a complex motor skill such as the squat exercise, provided more relevant informational cues to a student than verbal instruction. It is likely that visual learning is key to the development of learning physical skills for many people. There is evidence here of a general expectation for a visual model among skill learners

Demonstration by the instructor

All five of the participants indicated that they preferred a demonstration by the instructor when initially learning a skill. P4 explained, "I have to be shown how to do it

by the coach or by the instructor; they're going to want me to learn it. I want them to show me something specific..." P3 expressed her preference for a demonstration by the instructor by saying, "[The instructor] would stand on the deck; she would demonstrate it, ... [and] that's how I learned it." It would seem logical that the instructor is perceived as having expertise and is therefore a logical person to provide the visual model.

Demonstration by other students

The use of demonstrations by other students was based mainly on a need for self-comparison with others, as well as the benefits of obtaining a basic demonstration. As P4 recalled, " I notice, well, everyone else is doing it this way so I must be doing it wrong if I see other people doing it a different way." P5 used the demonstrations by the other students as an example of what the stroke should have looked like: "[After] having seen someone like [another student] swim a good lap or something, [I] try to remember what it looked like." Obviously, learners also feel that they can benefit from observing the movements of classmates, especially if those classmates are seen as reasonably skilled.

Visual demonstration in the water

A distinction was made between the benefits of a demonstration on the side of the pool and a demonstration in the water. P3 explained her preference for a demonstration in the water by saying, "In the water I think [it] helps a lot because you can see a little bit more of what is really going to happen. You know the resistance in the water itself is different compared to just the air..." P4 felt that an in-the-water demonstration helped her pick up some of the details involved in learning a skill, pointing out: "I would like for her to show me, like when she is in the water, and having her do it and seeing how she takes a breath, like for breathing."

The role of a demonstration is to provide an example or model of what needs to be done as well as to provide a means of comparison (Darden, 1997). The participants who described the need to be shown a demonstration were divided into two different categories to indicate the preference for an instructor demonstration versus a demonstration by other students. Both were used as a method of comparison. However, some of the participants were less confident of the ability of other students, assuming that the instructor was more capable of providing a more accurate demonstration. Furthermore, a new category was created to indicate the preference for a context-specific demonstration. It was felt that a demonstration done in the water would more accurately reflect the actual context in which the skill would be performed. By seeing the instructor perform this skill in the water, the students were able to see the movement carried out and watch aspects that affected the skill, such as the force of the water acting on the movement, as well as breathing technique and momentum of each stroke, as these factors were not apparent with an on-deck demonstration. Research on the use of demonstrations and visual aids has been shown that they are useful techniques in both cognitive and physical skill acquisition (Horn, Williams & Scott, 2002).

Al-Abood, Davids, & Bennett's (2001) research on the role of demonstrations in the classroom has shown that the performance of participants trying to approximate the coordination patterns of a dart-throwing task demonstrated by models is significantly improved through the presentation of intermittent demonstrations in comparison to solely through the provision of verbal instruction or no instruction at all. Sparrow, Shinkfield, Day, Hollitt, & Jolley (2002) have contributed to this body of literature by providing empirical evidence to show that complex kinematic patterns can be learned through the

observation of their smaller composite features without the use of corrective feedback. Weise-Bjornstal & Weiss (1992) studied the effects of visual demonstrations on the kinematic form of children learning an underhand softball pitch and found that the learners were able to closely match a model's movements with increasing precision as the number of trials increased. There was, however, no effect on the performance outcome until the visual demonstration was combined with verbal cues. Evidence for the need to combine a visual demonstration with verbal instruction was also provided by Bunyan & Barton (1993), who found that among a population of sports studies students learning a novel elementary kayak skill, verbal instruction acted to direct the learners' attention to the relevant information being provided as well as to aid in the prioritizing of the information, whereas visual learning alone did not allow for this process.

The learners in this study identified the use of real-life demonstrations as being important as a source of learning swimming skills. This appears to support the study of demonstrations as valuable, and expected instructional tools.

Personal

Watching / Seeing yourself

This category emerged because three of the five participants made reference to seeing/watching themselves as they were going through the required skills. This theme was unclear at first, but was clarified by P1 stating, "If there was a mirror, you probably wouldn't be imagining it as much as you would be looking at your own body." She assented to that statement. P2 also indicated that she was able to see herself making mistakes but specified, "That is only when my body is in my view. I don't mean mentally see myself…"

Can't always see yourself

Two of the five participants explained that there were circumstances under which it was not possible for them to physically see themselves going through the movements. P1 stated, "...a lot of things you can't see, doing [something] yourself." When asked what she would do if she were unable to see her own movements, P2 replied, "Then I do it by feeling", indicating the use of an alternate learning style.

Positive Use of Visual Aids

Use of pictures

For one of the participants, P3, it was clear that her preference for the visual learning style was extended to the use of pictures. P3 explained, "[the textbook] had pictures of swimmers doing the motions and stuff, and that really helps, too." As well, P3 went on to say "[on] all of [the instructor's] notes, she had those stick people with their body positions, and you could see how they would float in the water compared to the water line." Thus such pictures seemed to provide some learners with a relevant context for body position.

Use of videotapes

The same participant who expressed her preference for the use of pictures as a learning aid, (P3) described how her perfect learning experience involved the use of video recordings: "[I enjoyed] the time when she videotaped us and then we got to see it. And not just you alone, your partner's, too...it is hard to feel those [problems] in the water without seeing yourself. So seeing yourself on videotape, you can actually see it a lot more than you can just by her telling you...."

The instructor who taught the PAC class used videotape feedback once over the duration of the course in order to allow the students the opportunity to see themselves performing the skills while the instructor indicated to each which movements needed to be improved as well as reinforcing those which were being performed well. Jambor and Weekes (1995), indicated that this is a typical method used by instructors to provide feedback; however, the overall research on the use of visual aids in skill acquisition indicates that the success rate of this technique is quite low.

In fact, Miller and Gabbard (1988) looked at the effect of videotape replay viewing on the acquisition of tennis skills by university level students in a physical activity course. Their findings indicated that although they had empirical evidence signifying the possible benefits of videotape replay and the loop-film technique, there was basically no difference between the group who were instructed with verbal feedback only, the group instructed with the use of visual aids, and those instructed with loop film instruction; which is a film segment of an individual properly performing the skill combined with instructor feedback. Thus the use of video-tape replay is not guaranteed to improve learning.

Preference Not to Use the Visual Style

Not visual as much as descriptive information

P4 was the only participant who indicated that when given the opportunity to watch the instructor give a demonstration, she favoured the description of the skill over the visual demo, saying, "I guess that didn't help as much, but yeah hearing how to do it properly."

Difficulty with pictures

This category was also generated by the response of only one participant. P5 explained that an attempt to catch up on a missed class in which the instructor had introduced a novel stroke led P5 to look for information on the novel stroke using a poster with diagrams on the poolside wall. P5 described this opportunity as follows: "There is one little wall thing that actually had descriptions and pictures of how to do every stroke. So I looked at that for a side stroke to see what that looks like, but that was really hard to follow; it is not very well put together."

Auditory Learning

The second major theme, that of verbal instruction, was broken down into three subcategories: Personal use of the verbal learning style, instructor use, and the preference to not use the verbal style at all. As well, the quotes that substantiate the division between categories consisted of eight distinct aspects (Figure 5). The research on the role played by verbal instruction on the development of physical skills by way of feedback and the use of cue words, or self-talk will be discussed within each respective category.

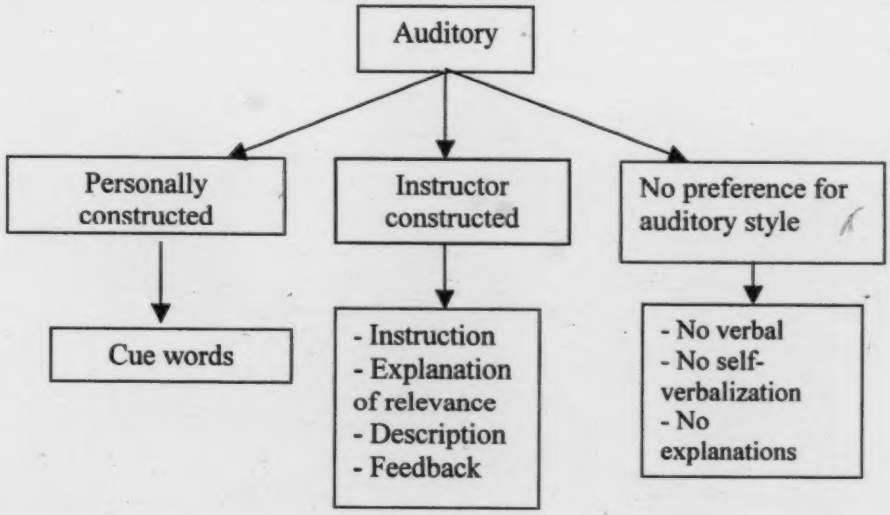

Figure 4.3 'Auditory' Sub Categories

Personally Constructed

Cue words

Two of the five participants indicated that they used cues words to help them with the timing of the skills as well as to remind themselves of the individual elements of each skill while they were practicing. P1 described her use of cue words by saying, "[the instructor] was giving out key words 'glide, glide'…, so when I tried it, I was listening to [the instructor] say 'glide, glide'." For P2, the use of cue words served as a reminder, "I'm saying [the words] to myself in my head so that I remember to do it all."

Landin (1994) explained that the use of self-talk helps a learner to process incoming information and store it for later use in the relevant situation; Anderson & Vogel (1999) more specifically described self-talk as the use of cue words that match the components of a particular movement. In a study conducted by Perkos, Theodorakis & Chroni (2002), it was found that among novice basketball players, instructional self-talk proved to be an effective tool to both improve performance and acquire novel skills when compared to a control group not using the technique.

The use of cue words by P1 and P2 conforms to Landin's (1994) description of self-talk as being a method of processing information and storing it for later use in a relevant situation, or as the participants in this class indicated, for when they were practicing each skill.

Instructor Constructed

Instruction

The general desire for verbal instruction or auditory learning, was indicated as being a necessary part of the learning process for all of the five participants. P5 described the use of verbal instruction as a tool for recall: "I would think back to the demonstration and what we were shown or just think of what we were told we were supposed to do." P1 also noted after watching herself on the videotapes of the participants, that she was using the verbal instruction provided by the instructor as a stimuli for the physical movement, "I noticed that when she was talking I was [physically] going through the movement… ." Obviously, the verbal information was providing cues that stimulated movement rehearsal for P1.

Explanation of relevance

The type of instruction provided was also an important factor in acquiring the skills presented in class. Early on during the interviews, four of the five participants made a distinction between a need for an explanation of the importance of a skill versus a need for a description of how to perform the skills being presented. P5 stated, "I have a much easier time learning something if I think it is useful." This was a sentiment that was echoed by P3, who commented, "It explains to you why you are doing it, and it just makes sense that way." Thus, for some, understanding the relevance of a technique or a skill was an important adjunct to learning it and was evident that such relevance could be provided verbally.

Description

All five of the participants deemed a description of the skill to be an important factor in its acquisition. P5 commented, "Initially [I like to hear] a description, or see a demonstration (usually demonstrations are descriptions with [the instructor] thrashing

around on the side of the pool), and then just doing laps and laps of [the skill]." P2 summed up her need for a description quite succinctly when she stated, "I like hearing the what."

Instructor's verbal feedback

Four of the five participants expressed the value they saw in the instructor's verbal feedback, which served both as a point of correction as well as reinforcement. P4 summed up her need for corrective feedback by saying "feedback is how I think I learn the most." In contrast, P1 indicated that instructor feedback was most useful in helping her acknowledge when she had successfully acquired a skill: "[I know I have acquired a skill] …by my coach telling me 'Okay, yeah that's right'."

Research concerning the influence of verbal instructor feedback indicates that the main sources of augmented feedback are focused on two areas: the result of the learner's actions, (for example lap timing in the pool) is known as the knowledge of results (KR); and feedback regarding the performance or the action itself, (such as the quality of a movement), is known as knowledge of performance (KP) (Schmidt & Young, 1991). There has been some disagreement in the literature as to the benefits of instructor feedback on performance. Winstein, Pohl, & Lewthwaite (1994) suggested that heavy external guidance through feedback may be detrimental to performance as it may lead to dependence on instruction; whereas Wulf & Shea (1998) suggested that a high frequency of instructor feedback can aid in the development of complex motor skills. However, they also indicated that a relationship might exist between task frequency and the optimal amount of feedback required for performance development.

An explanation of importance, description, and feedback were all divided into different categories according to what the participants felt were or were not beneficial to their skill acquisition. However, all of the categories are variations on sources of feedback provided by the instructor. For example, information about the purpose of a skill, or its description are considered to be knowledge of performance (KP), whereas the participant's comments about the instructor's feedback throughout the course can be more accurately labelled knowledge of results (KP) as they indicated that they relied on the instructor for corrective feedback and reinforcement when they had successfully acquired the skill necessary.

No Preference for Verbal Style

No verbal instruction

Two of the participants expressed their preference for a different learning style over the use of the verbal style. P1 was quite straightforward in claiming, "I'm not a big fan of people telling me what to do." P3 also indicated her preference for either the kinaesthetic style or the visual style over the verbal by stating "all this time I tried to kick my foot out, but it just still felt like I completely-- like I thought I was turning it out but I didn't know for sure if I was. But having her actually do it, I could feel how it was supposed to be…So seeing yourself on videotape, you can actually see it a lot more than you can just by her telling you, 'oh you need to turn your right foot out.' "

No self-verbalization

P5 was the only participant who did not use any sort of self-verbalization or cue word and commented, "The only stroke I verbalized anything with in the entire class was

the elementary back, 'cause she forced us to. Everything else I did [with] no verbalization."

No explanation

Two of the five participants said that they did not need an explanation for the purpose of the skill; rather, the importance was on one of the other learning styles. For example, when asked whether or not she needed an explanation to go along with a visual demonstration, P2 replied, "No, I don't really need a 'this is why'." P5 related the explanation for the use of a skill to motivation stating "If I can see why I need to do something then I don't need someone to explain it to me. But, if I don't see why, and there is no explanation then it is like I really don't care [for the skill]."

Cognitive Learning

The third main theme to arise was cognitive learning. Lee, Swanson & Hall (1991) explained cognitive processes as "conscious, goal-directed thoughts and behaviours that occur before, during, and after action. These processes include, but are not limited to, the strategies, decisions, and evaluations related to action" (p.75). Anshel (1990) described the information processing approach as the process a learner goes through to organize, understand, and react to the pertinent information involved in acquiring a skill. Lee et. al. (1991) described stages of cognitive processing as consisting of five major categories: selective attention, perception, decision-making, response execution, and feedback.

The five subcategories that emerged from the coding for this theme were as follows: focus, conscious thought, and application of knowledge, visualization/mental imagery, and the preference to not use mental imagery. It was found that the

subcategories for this theme were quite specific and did not need to be broken down any further in order to fully define the main category (see Figure 6).

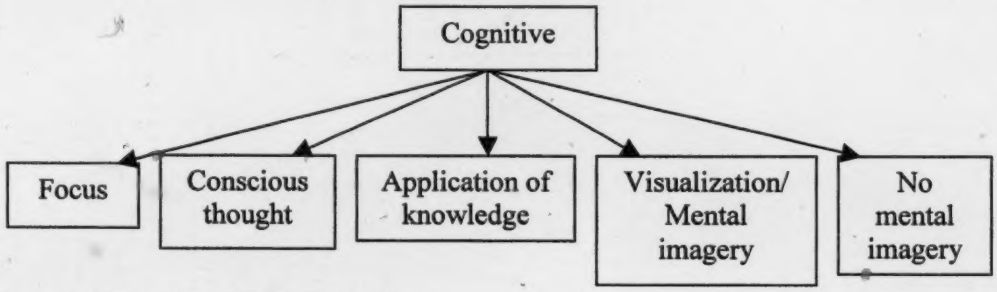

Figure 4.4 'Cognitive' Sub Categories

Focus

The idea of focusing on one movement or one part of a skill was a theme that arose consistently with one of the participants. P2 recalled one situation that she felt was ideal for helping to narrow her focus: "I have the floaty thingy on so I don't have to worry about my legs and [can] just focus on my arms…I didn't have to do any extra thinking, and I remember that I liked that."

The statement by P2 about needing to narrow her attention to a small part of her own movement is a good example of Wulf, McNevin, Fuchs, Ritter, and Toole's (2000) explanation that the issue of attentional focus is related to either drawing a student's attention to the effect that their movements have on the environment or the students' movements themselves.

Additional research addressing the range of focus in relation to different levels of performance, supports the inclusion of attentional focus as a lower order category within the cognitive theme when applied to a developmental situation. The issue of attentional focus can be understood using two dimensions, drawing students' attention to either the effects their movements have on the environment or on the students' movements

themselves (Wulf et. al. (2000). Wulf, Lauterbach, & Toole (1999) found that golf students performed better when they were instructed to focus on the effect of their movement, that is, the location of the shot rather than the swing or movement itself. Focus on an external target cue is a major factor differentiating a novice athlete from an elite athlete. Radlo, Steinberg, Singer, Barba, and Melnikov (2002) found that when looking at the physiological indicators of performance, such as brain wave frequencies and heart rate, a group of novice dart throwers who were instructed to focus their attention externally, in accordance to expert throwers behaviours, improved overall performance significantly. It has been found that when first teaching a skill, it is important to direct a learners attention to their own movements as doing so teaches them what needs to be controlled and why. In other words, novices need the opportunity to internalize the feeling of the movement being presented to them (Singer, Lidor & Cauraugh, 1994). Performance at an advanced level is enhanced when the learners' attention is directed towards the effects of their actions (Wulf, Shea & Park, 2001). The results of the present study that pertain to the issue of focus relate directly to the participants' comments on their attentional focus to each of their own body parts and the movements that needed to be executed.

Conscious Thought

This category was used to group the statements made by all five of the participants when they referred to the influence that their awareness or conscious thoughts had on their learning processes. P4 explained, "If I am just swimming, I'm not going to notice that my elbow isn't leading unless I'm consciously thinking about it." P2 also made quite consistent comments describing her thought processes: "...because I go slowly and I am

thinking. But I am concentrating so much on my arm going in the perfect 'S' [as that was the motion the instructor told us to use]."

The examples provided by the participants concerning the use of conscious thought reflect Lee et. al.'s (1991) stages of cognitive processing, consisting of five major phases: selective attention, perception, decision-making, response execution, and feedback; a process that is described as occurring before, during and after the action. The comments by participants P4 and P2 would appear to who's comments reflect the selective attention and response execution stages respectively.

Application of Knowledge

Questions regarding the application of knowledge to the practical component of the course were meant to elicit responses about the use of information gained from the lectures as well as any written work the participants may have done in preparation for their classes. For example, P4 described the value of the lecture information by saying:

> "as far as the stroke, I think it helped a lot…like for front crawl; she said that you want your body to be [as] streamlined as possible so you don't want to have your arms coming out to your side. So that made me think, okay, my arms are going to come more forward rather than to the side to get me to glide better to get a smoother stroke…"

P3 was the only participant who submitted a research paper rather than give an oral presentation to the class. P3 explained her reasoning for doing so by saying: "Going through the paper and going through the textbook and reading their thoughts on all the technical skills you have to go through for each part of your stroke. I think that helped prior to my exam, both the swimming one and the written one."

The description of both P4 and P3 about how they used the information they gained from the lectures, echoes Anshel's (1990) description of the role that information processing plays in the acquisition of a skill. That is, the organization, understanding and reaction to the pertinent information was evident in their comments. This information alludes to the possibility that understanding the critical features of a skill may make learning that skill easier.

Visualization/Mental Imagery

The use of visualization or mental imagery was mentioned by all of the participants. The images used varied, from picturing themselves, to picturing the instructor, to picturing a world-class swimmer. The details that the participants focused on also covered a variety of aspects. P1 described her pre-exam routine by saying, "The night before I was doing a little bit of—actually before all of the tests…I totally had it visualized, like where the camera was going to be and you know, me just swimming..." P2 described her use of mental imagery as an unidentifiable arm performing the perfect stroke: "[I'm] picturing clean perfect swimming by Alex Bauman or whoever."

As Hardy and Callow (1999) stated, external imagery provides perceptual information and is the quite advantageous for enhancing performance. The positive effects of imagery that the participants in this study felt they experienced may be due to the repetitious and constant pace that is the nature of swimming. It may also be significant in a skill like swimming, where there are not many external, visually available results such as a ball moving through space, or an image that a learner can follow in a mirror.

Denis (1985) described using mental imagery as "a psychological activity that evokes the physical characteristics of an absent object (either permanently or temporarily absent from our perceptual field)" (p. 4S). The use of mental imagery as a learning tool has been supported as being beneficial for improving sport performance (Bohan, Pharmer & Stokes, 1999; Hall, 1998). Cooper (1985) conducted a long term study looking at the effects of physical practice in comparison to the combination of mental and physical practice in college level physical education students learning three novel gymnastics skills. For eight weeks, one group of students were given twenty physical practice sessions while the other was provided with ten mental practice sessions and ten physical practice sessions. After a two year period of no practice all of the students were asked to perform the same three skills. The results indicated that although the mental practice seemed to have a positive effect on the skill acquisition there was no statistically significant effect at the time. However, when the two groups were compared regarding retention scores, the score for the mental practice group proved to be significantly higher than for the practice alone group.

Isaac (1992) found that the more vivid the imagery used by a group of elite and novice trampoline students, the greater the increase in overall performance. More specifically, Hardy & Callow (1999) found that external visual imagery that provided perceptual information was the most advantageous form of imagery for increasing performance across a variety of sports including karate, gymnastics, and rock climbing. Such imagery was more effective than internal visual imagery that relied on kinaesthetic imagery, which itself relied more on information about form. It has also been found that the combination of imagery and practice, (Kohl, Ellis, & Roenker, 1992; Waskiewicz &

Zajac, 2001), as well as imagery and verbal labelling (Hall, Moore, Annett, & Rogers, 1997) can act to increase the rate of learning as well as the recall of a given skill in the early stages of motor learning over the use of imagery alone. An issue related to the use of mental imagery is that the speed of image manipulation can be detrimental to the acquisition of performance in the presence of a time pressure factor (Lovell & Collins, 2001). A program geared towards creating a mental imagery program should take into account both the positive and negative effects of imagery under this condition

No Mental Imagery Used

Three of the five participants indicated that they did not use mental imagery or visualization as a learning aid. P4 stated, "I don't picture myself really; I picture how it feels. I don't really picture it or picture myself." P5 elaborated on a common sentiment among the three participants who formed this category: "If I'm just learning a skill, I don't picture myself doing it because normally I don't really have a clear idea of what they'll look like."

Kinaesthetic Learning

The fourth and final major theme discovered in the data was kinaesthetic learning. The concept of kinaesthetic learning can best be understood using McClements & Sanderson's (1998) explanation: Learners compare their own movements to a kinaesthetic template of how they think the movement should feel. Regardless of whether or not the template itself is technically correct, the learner's decisions about the feel of the movement are based on whether it has approximated that of the template. Boyce (1998) explained the concept of feel using a physiological perspective, stating that 'feel'

is the internal information based on kinaesthetic sensory perception that can be used to judge the success of a movement.

The kinaesthetic theme was comprised of five subcategories (Figure 7) identified as follows: mimicking, feeling, doing, physical manipulation, and the preference to not use the kinaesthetic style. Like the cognitive theme, the subcategories could not be broken down any further, and in fact it was not necessary to do so in order to help derive a definition for this style.

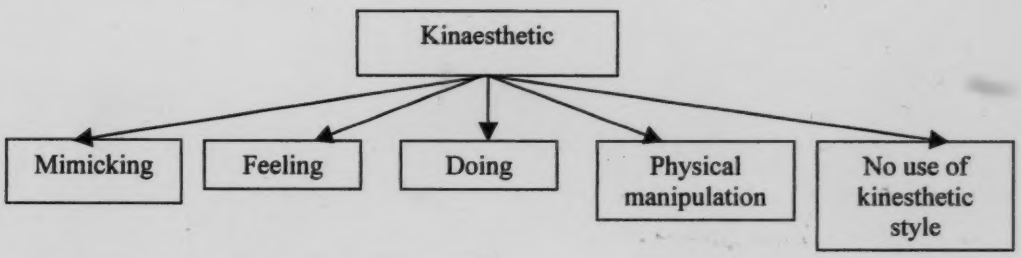

Figure 4.5 'Kinaesthetic' Sub Categories

Mimicking

As the classes were observed, it was quite common to see the students copy the instructor as she demonstrated a particular skill. Three of the five participants recalled their tendency to mimic or copy either the instructor's movements or those of the other students. P3 explained, "If you see somebody doing a skill…then you can kind of go ahead and you want to model whatever they are doing." P5 described the tendency to mimic the instructor by saying, "I think I was probably mimicking whatever motion [the instructor] was doing, I hate backstroke." Presumably, this was done in order to develop a sensory model.

Feeling

The feeling of a skill was a consistent theme with all of the participants. P1 explained what the feeling of a movement meant to her saying, "when you finally have gotten a hold of a skill, it is just by acknowledgment yourself and…then you say 'that feels right'." P5 described the feeling of a movement as more of a kinaesthetic cue: "Once I've done something right and I know it was right, I'll start trying to remember what that felt like." P2 explained the effect that the feel of a movement had on her perception of successful skill acquisition stating, "The moments when I feel my arms going in nice opposition and everything goes out-in-out and my body is nice and straight I can feel that I am doing it correctly…it feels good."

The participants who indicated that the feel of a movement is an important indicator of skill acquisition were referring to what Boyce (1998) explained as internal information based on kinaesthetic sensory perception. The phrase "that just feels right" used by P5 indicates that it was internal information that was used to help judge the appropriateness and success of the skills performed. This is probably more crucial in skills where visual feedback is limited or constrained.

Doing

The process of doing or practicing a skill was an important component of the kinaesthetic theme for four of the five participants. P1 described one of the most important personal factors for learning as: "Giving me time to pick up a skill and being able to work with it myself…after the lectures, I was actually fumbling around with positions to see what helped and what didn't." P4 was quite clear in how essential it was

for her to be given the opportunity to practice the skill being presented: "I have to practice it myself; I can't learn by someone just showing me; I have to do it myself."

Of course, physical practice is one of the most common learning techniques used in skill acquisition. Research conducted by Belkin and Eliot (1997) found that practice was beneficial when teaching children novel skills in floor hockey, they also observed that there might have been a trade off in terms of decreased accuracy of the skills when the goal was to effectively develop motor patterns, and vice versa. Research was conducted by Hird, Landers, Thomas, and Horan (1991) to compare different ratios of physical and mental practice on cognitive and motor performance. Undergraduate physical education class participants (N=72) who had no previous experience with the cognitive (pegboard) or motor task (pursuit rotor i.e. target tracking) were randomly assigned to one of six experimental and control treatments. The results indicated that although mental practice proved to increase performance between the mental practice group and the control group, physical practice proved to be more beneficial than mental practice overall. And, as the amount of physical practice increased, so too did the level of performance.

Physical Manipulation

The theme of physical manipulation arose out of the instructor's technique of manipulating the students physically to show them how their bodies should have been moving in order to successfully execute the skills with which they may have been having trouble. P3 explained the corrective benefit she received from the physical manipulation as follows, "I thought that I had kind of corrected [my problem] but [by] having [the instructor] actually manipulate my legs, I could still feel a difference, like 'Oh, I have to

do that more'." P4 described how physical manipulation helped her by saying, "[Physical manipulation] got me to find the range of motion, kind of how far I needed to get my leg out to get the power."

One way of producing a kinaesthetic feeling is that of being physically manipulated through a skill by an external force, usually another person. Research on the role of physical manipulation and skill acquisition has proven physical manipulation to be a useful teaching technique because it provides students with clarity of what a particular movement should look like, and how it should feel when going through the motion required of a movement (Wulf, Shea & Whitacre, 1998). Tsutsui and Imanaka (2003) looked at the effect of manual guidance on coordination learning. The researchers randomly assigned 32 right-handed young adults between 18 and 23 years of age to one of four groups (practice only, guidance only, mixed, and augmented). The students were then presented with a bimanual coordination task, where they were instructed to use their left hand to follow the pattern produced by their right hand. The results of the study indicated that although the practice- only groups performed better than the manual guidance only groups, the manual guidance group did improve their performance of the task between pre-test and retention. The results produced by Tsutsui and Imanaka (2003) seem to suggest that the manual guidance methods can be beneficial in producing a learning effect even though it may not be as strong as self-guided practice.

Wulf, Shea & Whitacre (1998) suggested that the benefits of physical manipulation lay in the provision of a clear image of what a movement should look like, as well as how it should feel when going through the motion required of a movement.

The sentiment was also generated from interviews with P3 and P4, describing how they were able to gain a feel for the motions through the instructor's physical manipulation.

No Use of the Kinaesthetic Style

The option of not physically practicing the skills for exam preparation was chosen by only one of the participants. P1, who was an extremely skilled swimmer, preferred to use visualization or mental imagery before each of the exams. P2, on the other hand, felt she got more out of hearing the instructor's feedback or being able to see herself while practicing than she did when she went by the feeling of a movement. She described one instance by saying, "I feel my elbow is coming up as high as it is supposed to, but until she tells me or if I was to see myself videotaped then I could go 'oh, it's only coming up that high' but it feels like it is coming up this high…"

Within the context of the present study, the four main learning style themes that emerged, visual, auditory, cognitive and kinaesthetic, would indicate that they greatly impact on learning and performance in physical activity. Support for the presence of the sub-categories and lower order categories that arose from the analysis of data in this study can be found through out the current research pertaining to learning styles and physical skill acquisition. Thus the learning styles themes and many of the subcategories identified by learners in this study echoed those receiving research attention in the field.

CHAPTER 5:

SUMMARY

The study was designed to answer the question: What are the possible learning styles that are employed in the acquisition of physical skills? The results of this study provide four prominent learning style themes that were identified by the participants. Those themes are: visual, auditory, cognitive and kinaesthetic. There have been many measures constructed for use in assessing preferred learning styles, the most prominent of which has been Kolb's Learning Styles Inventory (1976, 1988) and Dunn and Dunn's Learning Style Inventory (Dunn, Dunn, & Price, 1975, 1989). A loose relationship exists between the learning styles identified here and the four dimensions identified by Kolb (1976, 1988), which are, Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation AE). However, these dimensions are not specific enough to enable one to infer a direct connection between the dimensions and the learning styles generated in this study. Since Kolb was not concerned with physical skill learning, a direct correspondence between his styles and the ones in this study would not be anticipated.

The findings of the present study were most consistent with Dunn and Dunn's Learning Style Preferences in that they both established the presence of the same four dominant learning styles. This study, however, aimed to discover the preferred learning styles in the area of physical activity as an extension of the objective presented by the Ogilvie, Bailie, & Greene Learning Style Inventory (1997).

The information generated by this study was learner generated within a physical activity setting, and it could be initially inferred that an instrument containing these major

themes may cover the possible learning styles present in physical activity learning. It is important that the full range of meaning for each theme be identified as each has proven to be quite broad in the aspects that it covers. Based on the results produced in this study, definitions for each learning style have been constructed as follows:

Visual Learning-The use of the visual sense to stimulate learning, consisting of demonstrations, self-observations, and the use of visual aids such as pictures and video.

Auditory Learning- The use of verbal means to aid learning, inclusive of the following components: instruction, explanation, description, feedback, and the use of cue words.

Cognitive Learning- The mental processing of information that allows a student to learn a task; consisting of the opportunity to focus on the effect of movement on the environment, conscious thought, the application of knowledge, and visualization or mental imagery.

Kinaesthetic Learning- The process of learning attributed to physical practice consisting of one or more of the following aspects: mimicking, feeling, doing, and physical manipulation.

Dunn, Griggs, Olson, Beasley, & Gorman (2001) provided research supporting the theory that students who have their learning styles accommodated achieve higher grades academically than those who do not. The information provided by the current literature in this area of learning styles and skill acquisition combined with the results from the present study seem to suggest that there is a good possibility that a measure that is used to assess the learning styles of students in physical activity courses would be a beneficial tool to increase the efficiency as well as the effectiveness of the learning environment.

It is hoped the taxonomy created from this research may be further used to create a Physical Activity Learning Styles Profile which can be used as a tool to more accurately identify the learning styles employed by students/athletes in the context of a physical activity setting. As previously outlined, very little research has been done on the nature of learning styles specific to the context of physical activity, and so the profile generated could be a valuable tool in determining students' preferred learning styles if it can be applied to a teaching context or for use by a coach in a sporting context.

There are a few areas where it is necessary to acknowledge the limitations of this study. The results here cannot be generalized to any population other than the one with which it was conducted. It is also important to note that the population used was quite small and did not consist of any type of special population. It may be that that different populations may employ different learning style preferences, and conducting a similar study using populations such as children and students with physical or mental disabilities may produce a different variety of learning styles. There was also minimal representation of the male population and a study designed to examine gender effects and learning style preference may be of interest.

The findings from this study indicated that, depending on the context, there was a clear preference or dominant style that the individual participants favoured over the others. However, it appeared that although each student preferred a 'dominant' learning style, the overall learning experience involved different combinations of the styles in order to produce a feeling of success in acquiring a novel skill. It would be well worth conducting a similar study to discover if there are, in fact, other more effective styles or

combinations of styles that could make the learning experience more efficient for students.

As well, as a preferred learning style is mainly a matter of preference, other factors such as the skill level, situation, or activity type should not be constrained by the limitations in this study. A variety of other physical activities should be included in future research so that the styles will not be limited by any specific skills unique to any one sport or activity. Another important factor that needs to be mentioned is that the learning styles presented here are limited to those that were reported by the participants. Although other styles were observed within the context of the class, for example problem solving, they were not included in the compilation of preferred learning styles because they were not generated by the participants.

And finally, it is important to note that just because an individual may prefer to use one or a specific combination of styles, their learning repertoire should not be limited to learning only in that manner. It may be of interest to research methods that would increase the likelihood of having a learner become proficient at using multiple methods or styles in order to most effectively learn a novel skill.

Considering the findings of the present study, it is recommended that the instructors of physical activity courses try to incorporate as many aspects of the four major learning styles as is possible into the course instruction. It is not reasonable to assume that instructors should be able to cater to each student individually, but by trying to incorporate each of the learning styles into the class structure, it is reasonable to assume that a generous cross section of students will benefit.

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Appendix I - Novel Skills Questionnaire

Questionnaire of Novel Swimming 110 Skills

Please indicate which of the skills from the list below are skills for which you have had little or no experience prior to this class. Note: Stating that you have had little experience means that you are not able to execute the skill to the standards expected in the class. No experience with the skills means that you have no previous experience performing it. To possess sufficient ability with a skill implies that you are comfortable with the skill and feel you are able to perform at the level required by the course.

	No Previous Exposure	Little Experience	Possess Sufficient Ability with Skill
Front Crawl	_____	_____	_____
Back Crawl	_____	_____	_____
Breast Stroke	_____	_____	_____
Side Stroke	_____	_____	_____
Elementary Backstroke	_____	_____	_____
Double Over Arm Backstroke	_____	_____	_____
Inverted Breast Stroke	_____	_____	_____
Trudgeon	_____	_____	_____
Butterfly	_____	_____	_____
Whip Kick	_____	_____	_____

Appendix II - Information Letter

Title of Study: Creating a taxonomy of Learning Styles in an Athletic Context

Principal Investigator:

Mira Singh
Graduate Student
Faculty of Phys. Ed. and Rec
mmsingh@ualberta.ca

Supervisor:

Dr. J. M. Hogg
Professor
Faculty of Phys. Ed. and Rec.
Ph. 492-2830
john.hogg@ualberta.ca

DATE

Dear participant:

The purpose of this letter is to ask you to consider participating in a research project that is being conducted by a graduate student, Mira Singh, under the guidance of Dr. John Hogg of the Faculty of Physical Education and Recreation at the University of Alberta. The research project is designed to gather information about your experiences and perceptions of the different learning styles you may have encountered during your experiences in the area of skill acquisition. I am interested in how your experiences and perceptions of your learning styles affect your skill acquisition.

Should you agree to participate in the study you will be asked to participate in two interviews that will be between 45 and 60 minutes, with the investigator, myself. As well you will be asked for permission to videotape you in the context of your class through the duration of the course.

The information you provide will enable me to create a taxonomy of the many learning styles employed in the acquisition of a physical skill. It is my hope that the information you provide will be used to create a learning styles profile that can be used by physical educators/coaches in order to teach/train according to their preferred learning styles in order to increase performance development.

There are no benefits provided for participating in this study, nor are there any psychological or physical risks associated with participating in this study. However, there is always the chance that the discussion of information relating to performance development issues may in some way affect your progress in class.

To protect you against such concerns, a number of measures will be taken to ensure confidentiality:

1. No members of the teaching staff will be aware of which students are participating in the study. You are free to tell other students or instructors of your involvement, but disclosure of this information will be at your discretion.

2. Interview and observation data will be transcribed and assigned a code to ensure each student's confidentiality. The specific information you provide will not be shared with any individual participating in the development of this study.
3. The researcher will not discuss anything you say with any members of the class or the instructor(s).

Finally, to ensure confidentiality, personal information will be coded and stored in a locked filing cabinet in the graduate student carrels to which only the investigators will have access. Participants will not be identified in any presentation or publication involving this study. Normally data is retained for a period of five years post-publication, after which it will be destroyed.

The interviews will be structured around obtaining information with regards to your perceptions of the learning styles that you may employ for the acquisition of a physical skill. At the end of the interview you will be given an opportunity to indicate in writing whether you will (1) allow all of the information you provided to be used for research presentation purposes, (2) allow only certain portions of the interview information you provide to be used for research presentation purposes, or (3) allow none of the information

that you provide to be used for research purposes.

Please understand that your participating in this study is entirely voluntary. You may decline to participate, or withdraw from the study at any time, for any reason, without consequence. Should you choose to withdraw from the study, any information you provide during the study (i.e. interview and questionnaire material) will be destroyed.

Please feel free to contact myself (Mira Singh) or Dr. J. M. Hogg (492-2830) if you have any questions or concerns about the study. Alternatively, should you have any other questions or concerns about the study, you can contact Dr. Wendy Rodgers, who is the Chair of the Research Ethics Committee for the Faculty of Physical Education and Recreation at the University of Alberta (Tel: 492-5910, e-mail: wendy.rodgers@ualberta.ca). Dr Rogers has no direct involvement with this project.

Thank-you for your consideration. If you have indicated willingness to be involved in the study this letter will be returned to you at the first interview.

Sincerely,

Mira Singh
Graduate Student
Faculty of Phys. Ed. and Rec.

Dr. J. M. Hogg
Professor
Faculty of Phys. Ed and Rec.

Appendix III- Consent Form A

Title of Project: Creating a Taxonomy of Learning Styles in an Athletic Context

Principal Investigator:

Mira Singh
Graduate Student
Faculty of Phys. Ed. and Rec
mmsingh@ualberta.ca

Supervisor:

Dr. J. M. Hogg
Professor
Faculty of Phys. Ed. and Rec.
Ph. 492-2830
john.hogg@ualberta.ca

Do you understand that you have been asked to be in a research study?	Yes	No
Have you read and received a copy of the attached Information Sheet?	Yes	No
Do you understand the benefits and risks involved in taking part in this research study?	Yes	No
Have you had an opportunity to ask questions and discuss this study?	Yes	No
Do you understand that you are free to refuse to participate, or withdraw from the study at any time, without consequence, and that your information will be withdrawn at your request?	Yes	No
Has the issue of confidentiality been explained to you? Do you understand who will have access to your information?	Yes	No

This study was explained to me by: _____

I agree to take part in this study.

_____ _____ _____
Signature of Research Participant Date Witness

_____ _____
Printed Name Printed Name

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

_____ _____
Signature of Investigator or Designee Date

Appendix IV- Consent Form B

Title of Project: Creating a Taxonomy of Learning Styles in an Athletic Context

Principal Investigator:
Mira Singh
Graduate Student
Faculty of Phys. Ed. and Rec
mmsingh@ualberta.ca

Supervisor:
Dr. J. M. Hogg
Professor
Faculty of Phys. Ed. and Rec.
Ph. 492-2830
john.hogg@ualberta.ca

Have you read and received a copy of the attached Information Sheet? Yes No

Have you had an opportunity to ask questions and discuss this study? Yes No

Do you understand that your image my inadvertently be video taped for the purpose of this study?

Do you understand that any footage collected through the use of video recordings, that may contain your image, will not be used as data in the study? Yes No

Do you understand that you are free to refuse to participate in this study without consequence, and that and video footage containing your image will be destroyed immediately following recording sessions if you request it? Yes No

Has the issue of confidentiality been explained to you? Do you understand who will have access to your information? Yes No

This study was explained to me by: _____

I understand that my image may be caught on tape for this study, but will not be used as data by the researcher.

_____ _____ _____
Signature of Research Participant Date Witness

_____ _____
Printed Name Printed Name

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

_____ _____
Signature of Investigator or Designee Date

Appendix V (a) – Interview Guide 1

As a semi-structured interview was used, the questions were not completely chosen in advance, but the areas that were highlighted as well as the types of questions posed followed the outline suggested below. It is also important to note that where it was applicable, concrete examples from class were elicited in order to substantiate responses.

INTERVIEW 1

Key points to being the interview with:

- Reasons for the interview.
- Everything is relative to your perceptions.

Main Questions	**Possible Cues, Questions, and Probes**
➢ What behaviours are helpful when acquiring skills that vary between individuals?	➢ Is there a skill that you feel most uncomfortable with (using their novel sport as an example)? ➢ Reaction to arriving in class and finding out that you are going to practice that skill.
➢ What is important in an effective learning experience?	➢ What are some behaviours that someone who is watching you in class would notice? ➢ What constitutes an effective learning experience?

➢ Familiarity with the sport/degree of involvement.	➢ Ever participated other than for personal interest? ➢ When did you start? Why? How often? ➢ Have you always enjoyed it? Why/why not? ➢ What kinds of other activities do you enjoy recreationally?
➢ Specific individual attributes that have an impact on learning (keeping in mind that they are different for everyone).	➢ e.g. Persistence, Physical ability, Intelligence ➢ In what way? Elaborate and clarify
➢ Self monitoring of skill acquisition and development.	➢ What constitutes sufficient ability of a skill? Why? ➢ When do you feel that you possess sufficient ability with a skill? Why? ➢ What indicators do you look for?
➢ If you feel you do not have sufficient ability:	➢ How do you know? ➢ What makes you feel that way? ➢ What steps do you take to develop the skill further?

➢ What is you goal for the end of the course?	➢ Are there any skills you are set on developing? ➢ Have you set any mile stones you would like to aim for?

Appendix V (b) - Interview Guide 2

INTERVIEW 2

Main Questions	**Possible Cues, Questions, and Probes**
➢ Now that the course is over, do you have any thoughts on how you feel you learn best?	➢ Did you have any thoughts about your learning over the duration of the course? ➢ What was the context specifically?
➢ How do you feel you developed over the course?	➢ In relation to the skills you were most uncomfortable with? ➢ Did you meet your own expectations?
➢ What steps do you think you took to develop you skills?	➢ In preparing for you stroke count/video taped account? ➢ How did you practice? Did you use visualisation or imagery?
➢ When given the opportunity to teach a concept (water law), how did you go about doing it?	➢ What was the rational for it?

Lecture days: ➢ How did the lectures teach you about what you were learning?	➢ Do you prefer that to the practical classes? Why? ➢ Give me some examples of situations throughout the class that provided you with effective learning opportunities? Why?